

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. A method of an improved delivery system for gases generated via the sublimation of solid material precursors comprising:

2. introducing a solid precursor into a liquid bubbler apparatus;  
3. adding a liquid <sup>into</sup> said solid precursor-containing bubbler apparatus, said liquid chosen to have a vapor pressure which is negligible compared with said vapor pressure of said solid precursor under the operating conditions extant in said bubbler; said liquid also being chosen such that said solid precursor is sufficiently insoluble in said liquid such that recrystallization of material of said solid precursor is unobservable during the normal operating time required to deplete the precursor material in said bubbler and necessitate its refilling;

4. attaching said bubbler containing said solid precursor and said liquid to a reactor apparatus containing a substrate to which the precursor is to be applied; said bubbler containing a mixture of vapors comprising carrier gas and solid precursor; said carrier gas being either inert or reactive;

5. flowing said carrier gas through said bubbler to sweep said mixture of vapors into said reactor to coat said substrate.

2. The method defined in claim 1 wherein the vapor pressure of said liquid is less than  $10^{-8}$  Torr at room temperature.

3. The method defined in claim 1 wherein said solid precursor is any material having a solubility in said liquid of less than 1000 ppm.

4. The method defined in claim 3 wherein said solid precursor is any material having a solubility of less than 100 ppm.

✓ 5. The method defined in claim 3 wherein said liquid is a silicone oil oligomer.

Sub 7  
6. The method defined in claim 3 wherein said solid precursor material is selected from the group consisting of molybdenum, niobium, tantalum and tungsten.

✓ 7. The method defined in claim 6 wherein said solid precursor material is tungsten.

1 ✓ 8. The method defined in claim 6 wherein said solid precursor material is tungsten  
2 hexacarbonyl.

1 ✓ 9. The method defined in claim 6 wherein wherein said substrate comprises silicon,  
2 silicon dioxide or silicon nitride.

Sub 10  
10. The method defined in claim 1 wherein said solid precursor material is selected from the group consisting of molybdenum, niobium, tantalum and tungsten.

11. The method defined in claim 1 wherein: said solid precursor is selected from the group consisting of molybdenum, niobium, tantalum and tungsten;

said liquid added to said solid precursor-containing bubbler apparatus has a vapor pressure less than  $10^{-8}$  Torr at room temperature;

said solid precursor has a solubility in said liquid of less than 1000 ppm;

said substrate to which said precursor is to be applied is selected from the group consisting of silicon, silicon dioxide or silicon nitride; said carrier gas being either a noble gas or ammonia.

12. The method defined in claim 11 wherein said solid precursor is tungsten, said liquid is a silicone oil oligomer and said carrier gas is argon.

✓ 13. The method defined in claim 12 wherein said carrier gas is ammonia.

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